Name _____ Class _____ Date _____

Section 1: Genetic Variation Within Populations

Chapter 11 Reading Guide A

KEY CONCEPT

A population shares a common gene pool.

VOCABULARY

gene pool
allele frequency

MAIN IDEA: Genetic variation in a population increases the chance that some individuals will survive.

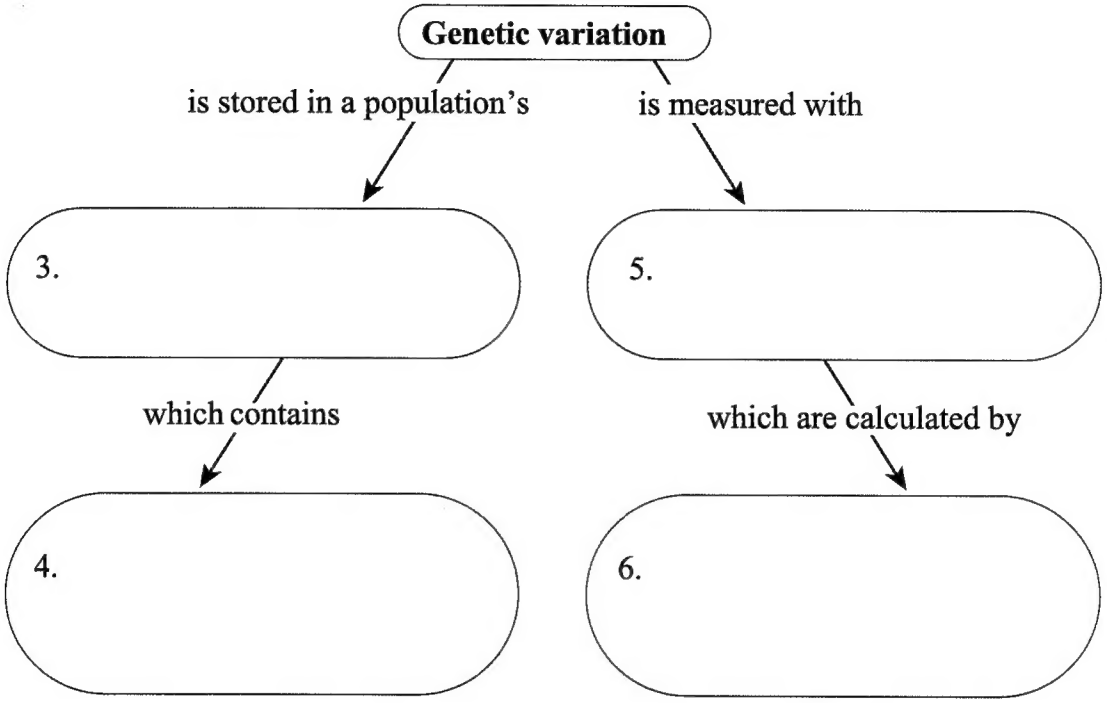
Choose the best answer to the question.

1. In order to have a wide range of phenotypes, a population must also have
   a. competition for scarce resources.
   b. genetic variation.
   c. environmental stability.
   d. a very ancient population.

2. How can a wide range of phenotypes increase the chance that some individuals will survive in a changing environment?
   a. Populations with many phenotypes tend to be very strong and hardy.
   b. Phenotypes tend to adapt along with the environment.
   c. A changing environment often produces a wide range of phenotypes.
   d. If there are many variations, there are more chances for some individuals to improve the chance of survival.

Use the words and phrases in the box to fill in the Concept Map below.

gene pool	allele frequencies	combinations of alleles	ratio or percentage



MAIN IDEA: Genetic variation comes from several sources.

mutation	recombination	hybridization

Match each term in the box with the description of how it provides a source of genetic variation.

Source	Description
7.	A random change in the DNA of a gene can cause a new variation of a trait to develop and be passed on to offspring.
8.	A new allele combination can occur during meiosis, when cells divide during sexual reproduction.
9.	Sometimes new species may develop when species that share common genes reproduce.

Vocabulary Check

Circle the word or phrase that best completes the statement.

10. A(n) population's *gene pool / allele frequency* contains the genetic variation for the entire population.

11. A(n) *gene pool / allele frequency* measures how common a certain allele is in the population.

Be Creative

In the space below, draw a logo advertising the importance of genetic diversity to a population.

Name _____ Class _____ Date _____

Section 2: Natural Selection in Populations

Chapter 11 Reading Guide A

KEY CONCEPT

Populations, not individuals, evolve.

VOCABULARY

normal distribution	directional selection	disruptive selection
microevolution	stabilizing selection	

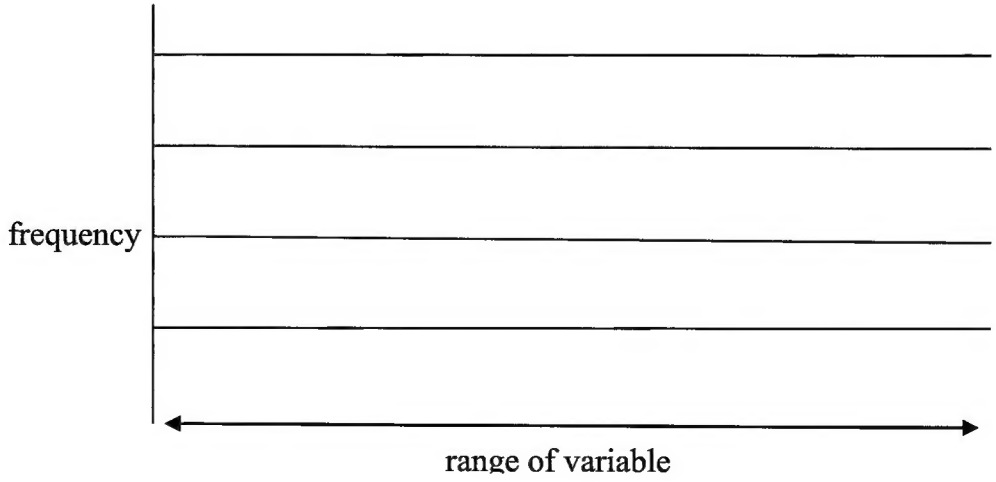
MAIN IDEA: Natural selection acts on distributions of traits.

Choose the best answer to the question.

1. What is a normal distribution of phenotypes?
   a. A distribution in which most of the population falls at one extreme or the other.
   b. A distribution in which most of the population occurs close to the mean.
   c. A distribution in which the population is evenly distributed across the entire spectrum.
   d. A distribution in which the population is randomly distributed across the entire spectrum.

2. What can you learn from looking at a phenotypic distribution?
   a. You might learn what characteristics are usually associated with survival.
   b. You might learn what characteristics are part of the fossil record.
   c. You might learn what characteristics are truly random mutations.
   d. You might learn what characteristics are vestigial.

3. In the space provided below, draw the phenotypic distribution for a trait that follows a normal distribution.



MAIN IDEA: Natural selection can change the distribution of a trait in one of three ways.

directional selection	stabilizing selection	disruptive selection

In the table below, label each of the three patterns of natural selection. The first one is labeled for you. Draw a graph for each type of selection.

Type of Selection	How It Works	Graph
4. directional selection	An extreme phenotype that was once rare becomes more common.	
5.	An intermediate phenotype is favored and becomes more common.	
6.	Both extreme phenotypes are favored, while individuals with intermediate phenotypes are selected against by something in nature.	

Vocabulary Check

Fill in the blank with the word that best completes the sentence.

7. The observable change in the allele frequencies of a population over time is called _____.

8. During _____ selection, the intermediate phenotype is selected for.

9. During _____ selection, both extreme phenotypes are selected for.

10. During _____ selection, the mean phenotype changes.

Name _____ Class _____ Date _____

Section 3: Other Mechanisms of Evolution

Chapter 11 Reading Guide A

KEY CONCEPT

Natural selection is not the only mechanism through which populations evolve.

VOCABULARY

gene flow	bottleneck effect	sexual selection
genetic drift	founder effect	

MAIN IDEA: Gene flow is the movement of alleles between populations.

Circle the word or phrase that best completes the statement.

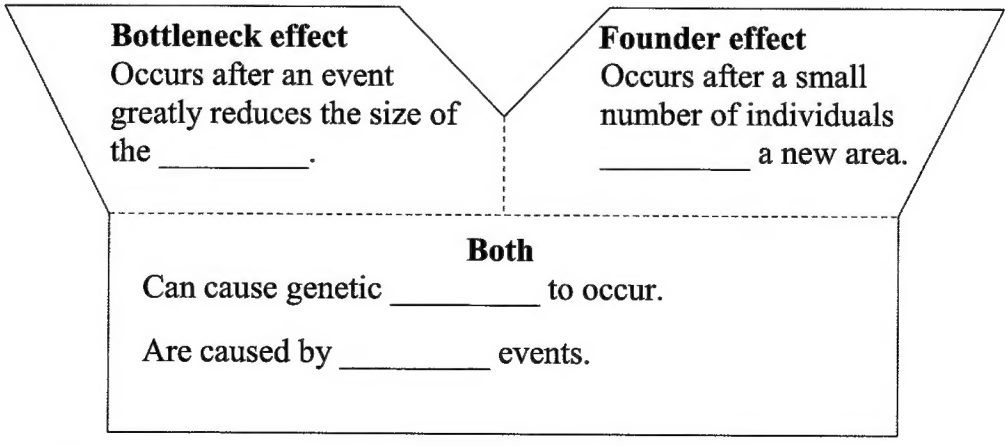
1. When an individual *moves from / reproduces in* its population, its alleles are no longer part of that population's gene pool.
2. When an individual moves into a new population, the genetic diversity of the new population *increases / decreases*.
3. Gene flow among neighboring populations helps to keep their gene pools *similar / diverse.*

MAIN IDEA: Genetic drift is a change in allele frequencies due to chance.

Choose the best answer to the question.

4. How is genetic drift different from natural selection?
   a. Genetic drift prevents natural selection.
   b. Genetic drift occurs by chance alone.
   c. Genetic drift only occurs in marine species.
   d. Genetic drift is a method used for breeding.

Fill in the blanks in the Y-notes to compare and contrast the bottleneck effect and the founder effect.



Choose the best answer to the question.

5. Genetic drift is more likely to occur in _____ populations.
   a. small
   b. medium
   c. large
   d. established

6. What is one problem that can result from genetic drift?
   a. loss of genetic variation
   b. increased genetic variation
   c. changes in genetic variation
   d. changes in genetic variation of neighboring species

MAIN IDEA: Sexual selection occurs when certain traits increase mating success.

Circle the word or phrase that best completes the sentence.

7. The cost of *reproduction / sexual selection* is different for males and females.

8. In many species, females are *more / less* choosy than males about mates.

9. During *intrasexual / intersexual* selection, males compete for females.

10. During *intrasexual / intersexual* selection, males display certain traits to attract females.

Vocabulary Check

In the spaces provided below, draw pictures that help you to remember the definitions of the vocabulary words.

11. Gene Flow	12. Bottleneck Effect	13. Founder Effect

Name _____ Class _____ Date _____

Section 4: Hardy-Weinberg Equilibrium

Chapter 11 Reading Guide A

KEY CONCEPT

Hardy-Weinberg equilibrium provides a framework for understanding how populations evolve.

VOCABULARY

Hardy-Weinberg equilibrium

MAIN IDEA: Hardy-Weinberg equilibrium describes populations that are not evolving.

Choose the best answer to the question.

1. What variable remains constant, or in equilibrium, in the Hardy-Weinberg model?
   a. genetic variation
   b. population
   c. reproduction
   d. immigration

2. What happens to a population that is in Hardy-Weinberg equilibrium?
   a. It evolves much faster.
   b. It evolves much slower.
   c. It evolves at a uniform pace.
   d. It stops evolving at all.

3. Name one way that population biologists can use Hardy-Weinberg equilibrium.
   a. To compare real data to data that are predicted by a model.
   b. To help them understand what can happen to a population without genetic drift.
   c. To predict what will happen if a population is colonized by random immigrants.
   d. To model what could occur if new alleles were added to a population.

MAIN IDEA: The Hardy-Weinberg equation is used to predict genotype frequencies in a population.

4. Find the Hardy-Weinberg equation in Section 4 of the textbook and copy it here:

5. In the table on the following page, fill in the variable or the missing information about the variables involved in the Hardy-Weinberg equation.

Variable	What It Represents
	frequency of dominant homozygous genotype
$2pq$	
	frequency of recessive homozygous genotype
p	
	frequency of recessive allele

Circle the word or phrase that best completes the statement.

6. The Hardy-Weinberg *equation / equilibrium* can be used to determine whether a dominant and recessive allele are present in equal quantities in a population.

7. To use the Hardy-Weinberg equation, a biologist must know the frequency of *emigrations into the population / the dominant and recessive alleles*.

8. If real genetic data do not match the frequencies predicted by the equation, biologists know that the population *is / is not* still evolving.

MAIN IDEA: There are five factors that can lead to evolution.

genetic drift	gene flow	mutation	sexual selection	natural selection

9. Write the words from the box next to the matching descriptions in the table.

Factor	How It Can Lead To Evolution
a.	Allele frequencies of already existing alleles can change due to chance alone.
b.	The movement of alleles from one population to another changes the allele frequencies in each population.
c.	New alleles can form through mutation, creating the genetic variation needed for evolution.
d.	Certain traits can improve reproductive success, causing alleles for those traits to increase in frequency.
e.	Certain traits can improve survival, causing alleles for those traits to increase in frequency.

Vocabulary Check

Fill in the blank with the word that best completes the sentence.

10. A population is said to be in Hardy-Weinberg equilibrium for a trait if _____ stay the same from generation to generation.

Name _____ Class _____ Date _____

Section 5: Speciation Through Isolation

Chapter 11 Reading Guide A

KEY CONCEPT

New species can arise when populations are isolated.

VOCABULARY

reproductive isolation	behavioral isolation	temporal isolation
speciation	geographic isolation	

MAIN IDEA: The isolation of populations can lead to speciation.

Fill in the blank with the term from the box that best completes each statement.

environments	gene pools	mate	species
gene flow	genetic drift	speciation	

1. Two populations are said to be in reproductive isolation if they can no longer _____ successfully with each other.
2. Random processes like mutation and genetic drift can change _____.
3. Isolated populations may become genetically different as they adapt to new _____, or through random processes such as mutation and _____.
4. If _____ between two populations stops for any reason, the populations are said to be isolated.
5. Reproductive isolation is the final step of _____, which is the rise of two or more species from one existing species.
6. The experiment illustrated in Figure 5.1 shows how just one _____ can provide enough genetic difference to result in reproductive isolation.

MAIN IDEA: Populations can become isolated in several ways.

Choose the best answer to the question.

7. Differences in courtship or mating behaviors can cause a species to develop
   a. behavioral isolation.
   b. geographic isolation.
   c. temporal isolation.
   d. genetic variation.

8. Fill in the blanks in the chart below.

Type of Isolation	How It Works	Examples
_____ isolation	isolation caused by differences in courtship or mating behaviors.	_____ scents, courtship _____, courtship songs
geographic isolation	isolation caused by physical _____ that divide a population into two or more groups.	rivers, mountains, dried lakebeds
temporal isolation	exists when timing prevents _____ between populations.	differing pollination periods

Vocabulary Check

Match each word or phrase with its definition.

behavioral isolation	reproductive isolation	temporal isolation
geographic isolation	speciation	

9. _____ Isolation that exists when timing prevents reproduction between populations.

10. _____ Isolation that involves physical barriers that divide a population into two or more groups.

11. _____ Isolation that occurs when members of different populations can no longer mate successfully with each other.

12. _____ Isolation caused by differences in courtship or mating behaviors.

13. _____ The rise of two or more species from one existing species.

Name _____ Class _____ Date _____

Section 6: Patterns in Evolution

Chapter 11 Reading Guide A

KEY CONCEPT

Evolution occurs in patterns.

VOCABULARY

convergent evolution	coevolution	punctuated equilibrium
divergent evolution	extinction	adaptive radiation

MAIN IDEA: Evolution through natural selection is not random.

Fill in the blanks in the Main Idea Web below.

different	evolution	selection
environment	natural selection	species

2. Natural _____ moves in a direction that is controlled by the _____.

3. The effects of _____ add up over many generations.

1. **Main idea:** Evolution through natural selection is not random.

4. Convergent evolution: occurs when _____ species must adapt to similar environments.

5. Divergent _____: occurs when closely related species evolve in _____ directions.

MAIN IDEA: Species can shape each other over time.

Fill in the blanks in the table below.

Type of Coevolution	How It Works	Examples
6. _____ relationship	During coevolution, two or more species evolve in response to changes in each other.	bull thorn _____ and ants
7. evolutionary _____	Different species can respond to _____ from each other, producing better adaptations over many generations.	crabs and snails

MAIN IDEA: Species can become extinct.

Fill in the blanks in the table below.

Type of Extinction	Possible Causes	Outcome
8. _____ extinction	A local change in the _____ such as the introduction of a predator or a decrease in the food supply.	Loss of one or a few species
9. _____ extinction	A catastrophic event such as an ice age or asteroid impact	Loss of _____ species

MAIN IDEA: Speciation often occurs in patterns.

Circle the word or phrase that best completes the sentence.

10. The theory of punctuated equilibrium states that relatively brief episodes of *speciation* / *evolution* are followed by long periods of little evolutionary change.

11. Adaptive radiation is a process in which one ancestral species diversifies into many *similar* / *different* species.

12. Adaptive radiation occurred after the extinction of the *dinosaurs* / *dodo*, because they left a wide range of opportunities into which mammals could diversify.

Vocabulary Check

Match each word or phrase with its definition.

13. episodes of speciation that occur suddenly in geologic time — a. extinction

14. diversification of one ancestral species into many species — b. convergent evolution

15. elimination of a species from Earth — c. divergent evolution

16. process in which species evolve in response to changes in each other — d. coevolution

17. evolution that occurs when related species evolve in different directions — e. adaptive radiation

18. process that occurs when similar characteristics develop in unrelated species — f. punctuated equilibrium